

Consensus Statement – Suggested Recommendations for Acute Stroke Management during the COVID-19 Pandemic: Expert Group on Behalf of the Indian Stroke Association

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Abstract

The ongoing pandemic of COVID-19 is a global public health emergency. This has led to challenges for healthcare facilities to optimally manage other important medical emergencies. Stroke is an important public health emergency with significant mortality and morbidity. Timely treatment of acute stroke is critical to prevent disability. The current expert consensus statement on behalf of the Indian Stroke Association outlines the issues and suggestions related to the management of stroke during this ongoing COVID-19 pandemic.

Keywords: Acute stroke, COVID-19, ischemic stroke, thrombectomy, thrombolysis

Summary Statement

- Stroke is a disease carrying high “mortality and morbidity.”
- The current pandemic has led to an enormous burden on healthcare resources thereby causing a reorganization of services across many hospitals.
- Patients with an acute stroke need optimum management and prioritization even during a pandemic.
- Robust screening of individual patients for COVID-19 should be performed at the level of triage in every hospital using a standard detailed checklist.
- Local systems need to be reorganized to manage patients at the designated centers by local health authorities where these acute medical emergencies could be managed appropriately.
- All COVID-19 suspect stroke cases should be managed in designated COVID-19 health facilities.
- However, in circumstances where the primary contact hospital is not a designated COVID-19 center, and it is not possible to refer the patient on time to the COVID-19 designated hospital, and considering that stroke management is time-sensitive, the primary contact hospital may consider managing the patient, provided all laid down guidelines as per MoHFW, Govt of India, are in place and the patient is notified. The patient should then be shifted to the designated COVID-19 hospital as soon as possible for admission with prenotification and appropriate transfer method. (see details in the document)
- COVID-19 positive stroke patient should be managed in designated health facilities for COVID-19.
- Report of laboratory testing for COVID-19 suspect patients should be available on priority to guide the management.
- Appropriate protection should be provided to healthcare workers and patients as per standard guidelines. Limitations of PPE will require minimizing and optimizing staff on duty.
- Standard acute stroke treatment guidelines will apply to the management of patients. Individualized decisions will need to be taken for patients with a serious COVID-19 illness.
- Hospitals may consider designating a separate CT machine for acute imaging of a COVID-19 suspect or positive patients in the designated areas and appropriately sanitize the area after use as per standard protocols. Standard imaging protocols will apply. Optimize/minimize the use of MRI during this pandemic to reduce exposure to the staff and system.

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- Intravenous thrombolysis in the absence of any major contraindication should be provided with either IV Alteplase or IV Tenecteplase in standard doses followed by post thrombolysis monitoring to all eligible patients.
- Mechanical thrombectomy should be provided to eligible patients with large vessel occlusion if the facility is available at the designated hospital. The challenge will remain for either designating a particular angiosuite if feasible or sanitizing the angiosuite used when treating a COVID-19 suspect or positive case. It will be prudent to discuss with colleagues and administration to organize the local needs as deemed best feasible. Standard PPE care is essential.
- Individualised decision regarding thrombolysis and endovascular stroke treatment may need to be taken in patients seriously ill due to COVID-19.
- The non-COVID-19 suspect or negative patients should be provided care in the designated stroke unit or inpatient unit.
- COVID-19 suspect or active patients have to be provided care in designated hospital areas only (till test reports of final COVID-19 status are available for suspected patients). Limitations of care may arise, but standard guidelines should follow for monitoring and advice. It may be prudent to educate the health care workers in COVID-19 demarcated area about stroke. Checklists and stroke protocols could be made available for these areas to follow and discuss with the stroke team.
- Telemedicine could be used for consultations between designated areas and specialty areas within or outside the hospital.
- Etiological evaluation should be focused on the most important components as deemed feasible. Appropriate secondary prevention should be provided.
- Rehabilitation is likely to be suboptimum and should focus on the most immediate needs of the patients. Tele-rehabilitation resources if available may be utilized.
- Discharge of stable COVID-19 negative patients should be planned early to minimize exposure and also reduce the burden on the health system. Discharge of COVID positive patients should follow standard guidelines.
- Telemedicine consultation should be considered for follow-up visits.

BACKGROUND AND THE NEED

The ongoing pandemic of COVID-19, a disease caused by the novel SARS-CoV-2 (severe acute respiratory syndrome, coronavirus-2), is now a global public health emergency.^[1] This has brought with it enormous health challenges for all countries, including economic, infrastructural, containment, and healthcare worker safety. With increasing numbers in India, the challenges will likely increase. Although the burden is still lower compared to the large burden in many other countries, where reorganization of stroke care is imminent.

Neurological manifestations of COVID-19 are being increasingly recognized which may be coincidental and may even precede pulmonary symptoms and fever. More than one third may present with features referable to the central nervous system (CNS) including stroke. Moreover, neurological symptoms are more common in patients with severe infection, among them being ischemic or hemorrhagic stroke and encephalopathy.^[2,3] Among the 214 patients admitted in Wuhan, China, 78 patients had some neurological symptoms.^[2,3] Cerebrovascular disease was observed in 6 (2.8%) patients and was more common among patients with more severe disease (5 out of 6 patients). In another study on acute cerebrovascular disease observed among admitted patients with COVID-19, ischemic stroke was the most common, and stroke occurred more in the elderly and middle-aged with vascular risk factors and 38% of them died.^[3,4] COVID-19 is more likely to happen among people with some known vascular risk factors and also carries higher mortality amongst them.^[5] In a recent metanalysis of 76993 patients with SARS-CoV-2 disease,^[6] the pooled prevalence of hypertension, cardiovascular disease, history of smoking, and diabetes were estimated as 16.37% (95%CI: 10.15%–23.65%), 12.11% (95%CI 4.40%–22.75%), 7.63% (95%CI 3.83%–12.43%), and 7.87% (95%CI 6.57%–9.28%), respectively. Another systematic review also showed predominant comorbidities to be hypertension and diabetes.^[7]

Stroke is a major cause of death and disability in India and around the globe. This requires prompt treatment and decision-making and 24 × 7 preparedness for the hospitals to provide evidence-based care that is essential for good outcomes in ischemic stroke as well as other stroke subtypes [intracerebral haemorrhage (ICH) and cerebral venous thrombosis (CVT)]. The ongoing pandemic brings with it many challenges,^[8,9] be it overwhelmed emergency rooms, manpower issues, screening issues, resource limitations, prioritization, creating more quarantine facilities, caring for our healthcare workers by the provision of adequate personal protective equipment (PPE) supplies, and above all optimizing care in an acute stroke patient who is a COVID-19 suspect or positive. Even during a pandemic, acute stroke and a coronary event is still an emergency and requires a coordinated team effort that would be compromised in situations like the ongoing COVID-19 pandemic. Even China reported a reduced functioning of stroke centers mainly due to fear of in-hospital cross infection and lack of experienced stroke care experts.^[8] This calls for rapid planning and modifications of existing care paradigms and systems of care as per the healthcare guidelines without putting a burden on existing infrastructure. The concept of “*protected stroke code*,” refers to the concerns related to preparedness for managing acute stroke and preventing healthcare workers and other patients from getting exposed to the virus.^[9] Worldwide, even countries with highly efficient stroke systems of care are reporting patients, who after having an acute stroke have no idea whether to attend hospital and where to go for treatment due to the extant crisis. In India, this

Hence, the “Indian Stroke Association” (ISA) is issuing this consensus statement taking into account the ongoing pandemic and the need to provide a treatment paradigm for our patients with stroke [Flow chart]. This is not an exhaustive guideline document, but it is hoped that this expert consensus might

provide some degree of direction to centers handling strokes at various levels, to reorganize their systems of care in whatever capacity it seems possible and feasible after discussion with their healthcare professionals and administrative colleagues.

EMERGENCY SCREENING AND TRIAGING

It is prudent that each hospital has a separate screening area that is before the main emergency triage. The suspected stroke patient should be rapidly screened using a predefined rapid checklist (infection control screen) for COVID-19 risk and active disease on high priority. The stroke team should be *immediately notified* and all patients/bystanders must be given a self-declaration form and a patient information sheet filled. An infection control screen should assess for the following constellation of signs and symptoms: fever, cough, chest pain, dyspnea, anosmia, headache, myalgias, and gastrointestinal symptoms including vomiting and diarrhea.^[8] The standard guidelines for managing COVID-19 patients or suspects should be followed as laid down by the Ministry of Health and Family Welfare (MoHFW; <https://www.mohfw.gov.in/>), Government of India.^[14,15,16]

COVID-19 Screen negative patients:

Once notified to the stroke team, patients with no suspicion of COVID-19 will rapidly proceed to either the main emergency or directly to the computed tomography (CT) scan room as per the protocol of the local hospital followed by the timely standard acute stroke treatment. In case the patient later turns out to be COVID-19 positive, guidelines of MoHFW should be promptly followed.^[16]

For a COVID-19 suspect patient

A. If a patient happens to be in a *COVID-19 designated hospital*, the patient proceeds through the outlined mechanism through a *specific corridor with all laid down precautions and the safety of the healthcare provider and the health system*. This concept has also recently been referred to as the “protected stroke code.”^[9] Since time is a critical component, we strongly recommend hospitals to plan with the neurology/stroke faculty, COVID-19 managing team, and hospital administration to designate appropriate areas/corridor for such patients, including separate imaging area, angiosuite area wherever feasible and possible in these hospital settings for emergent imaging and timely treatment. Healthcare personnel protection is recommended. The patient test swabs for SARS-CoV-2 should be sent emergently and depending on the results of the test, the decision should be taken to transfer the patient to the inpatient neurology unit/stroke unit from the designated isolation monitoring area. In case staff and exposure need to be minimized because of limited resources, telemedicine may provide a solution.

B. If a patient happens to be in a *non-COVID-19 designated hospital*, then as per the advisory of the ministry of health and family welfare (MoHFW), Government of India,^[15] ([https://www.mohfw.gov.in/pdf/Final Guidance on Management of Covidcases version 2.pdf](https://www.mohfw.gov.in/pdf/Final%20Guidance%20on%20Management%20of%20Covidcases%20version%202.pdf), accessed on 12.04.2020), the patient

is referred to a COVID-19 designated hospital, preferably where acute stroke can be managed either by the local team available or in liaison with the nearest available stroke team to provide the necessary treatment within the eligible time window. Due to the dynamic nature of the MoHFW, Govt of India, guidelines, updation of these guidelines should be checked periodically.

However, in situations where this is not timely possible or the designated COVID-19 hospital is far, considering the *time-sensitive nature of stroke treatment*, and in patients presenting within the eligible time window for stroke treatment, a probability of managing the patient within the primary contact hospital (in case the hospital can manage acute stroke) may be considered by the contact hospital with all due precautions and laid out guidelines of MoHFW, Govt of India^[14,15] and notification to NCDC^[17] (National Center for Disease Control), IDSP^[18] (Integrated Disease Surveillance System) (<https://idsp.nic.in/>), and local health authorities. Such centers must have in-hospital administrative decisions in place and should have adequate preparedness to manage such a situation if it arises, with strict facilities for isolation as laid down by MoHFW.^[14,15,16,19]

Testing for SARS-CoV-2 should be sent as soon as possible by information to the designated laboratories. Once timely treatment has been provided, or if after the initial evaluation, the patient is not eligible for any acute intervention, the patient should be transferred to the designated COVID-19 hospital preferably with pre-notification and with due transfer guidelines in place.

COVID-19 positive patient

The COVID-19 positive patient should be referred to the COVID-19 designated hospital for necessary management as per the guidelines.^[15]

It is advisable that *all hospitals could also preemptively determine whether the COVID-19 designated hospitals in their vicinity are capable of providing acute stroke care and consider to make appropriate arrangements in their respective protocols to refer the patients to these COVID-19 designated hospitals if the need arises. In any situation, time is of essence and systems should be in place to take quick decisions.*

Recommendations:

- Rapid screening should be done in the screening areas for patients presenting with stroke and stroke team notified.
- Evaluation and management should not be delayed.
- COVID-19 suspect patient should be treated at the designated COVID-19 hospital, in consultation with the local experts or in liaison with the nearest available stroke team to timely provide the necessary treatment.
- Considering the time-sensitive nature of the disease, the primary contact hospital may consider managing the patient in the acute phase of the stroke in case it is not possible to shift the patient to the designated COVID-19

hospital on time, provided all laid down guidelines of MoHFW, Govt of India, are in place and the patient notified. The patient should then be transferred to the designated COVID-19 hospital as soon as possible for admission with prenotification and appropriate transfer method.

- COVID-19 positive patient should be referred to the designated COVID-19 hospital.

ACUTE IMAGING

The basic imaging protocol as recommended by most guidelines is retained during the current pandemic. Pre-existing imaging protocols can be retained. However specific caution is required and additional recommendations can be made for the current exigency.

It is recommended that wherever feasible, a separate pathway for stroke patients be established during this pandemic whereby all imaging areas (CT/MRI/angiography, etc) be strictly separated from routine emergencies ("Stroke Green Pathway").^[20]

For COVID-19 suspect and positive patients, hospitals should have a predesignated CT facility where ever possible. Prenotification to the CT facility should be done for rapid imaging and preparedness of the staff. In the event of the inability to designate CT services specifically for COVID-19 suspects or patients, a general CT machine should be used and the area sanitized after the procedure by standard protocols. All patients with acute stroke who undergo noncontrast CT (NCCT) head should also undergo CT chest to detect peripheral pneumonic patches which may suggest infection with COVID-19. The concept of a portable CT scanner at the level of triage has also been suggested in a recent publication.^[21] Additional imaging such as MRI will need to be done sparingly and only for an utmost necessity such as in a suspected mimic, atypical brain hemorrhage, wake up ischemic strokes, or in a patient with ischemic stroke with clinical-CT mismatch and wherever treatment paradigms for managing such situations are possible.

Placement of a surgical mask on the non-intubated patient is recommended at all times while the patient is transferred to, during, and back from imaging if the patient can tolerate it.^[9] Supplemental oxygen with nasal prongs can be applied underneath the surgical mask. For patients getting transferred to digital subtraction angiography (DSA), similar precautions for patients and teams need to be adopted with appropriate inter-team communication. If the patient is obtunded or requires high fractions of inspired oxygen ($\text{FiO}_2 > 0.5$), an intensivist consultation should be taken for airway management and anesthesia practice recommendations are followed.^[22,23] For all procedures practice recommendations as laid down in guidelines should be followed.

Recommendations:

- NCCT head is mandatory for all patients with a suspected stroke.
- Standard imaging protocols should be followed.
- A follow-up CT scan at 24 h is recommended wherever possible.
- Follow strict guidelines for handling suspected and positive COVID-19 patients.
- A dedicated CT facility should be earmarked by the hospitals for treating COVID-19 suspected and positive patients wherever possible.
- Routine CT service with all precautions in place should be used in the advent of the inability to designate a dedicated facility and the area sanitized as per standard procedures after the completion of the test.
- CT chest should be done in the same setting in COVID-19 suspected or positive patients.
- MRI should be used sparingly and only when essential.

ACUTE INTRAVENOUS THROMBOLYSIS

All eligible patients of acute ischemic stroke should be offered thrombolysis in the absence of any specific contraindications.

Since treatment effect with thrombolysis is time dependant, attempts to keep the shorter door to needle times should be made even during the pandemic period. The indications, contraindications, and additional recommendations for intravenous thrombolysis remain unchanged from the American Heart Association (AHA) 2019 guidelines and Indian Stroke Guidelines.^[10-13] Adherence to guidelines is suggested.^[24] Only the assessment of blood glucose must precede the initiation of IV thrombolysis in all patients. Other tests e.g. International normalised ratio (INR), activated partial thromboplastin time (APTT), and platelet count may be necessary for some circumstances if there is suspicion of a coagulopathy. *Evaluating platelet count in suspect or positive COVID-19 patients before IV thrombolysis is preferable* given frequent cytopenia's seen in COVID-19 infected patients. In light of emerging reports of COVID-19 patients presenting as strokes, it would be prudent to routinely perform D-Dimer for all patients during this pandemic.^[25,26] Dosing, the methodology of administration of IV alteplase and tenecteplase remains unchanged. Frequent blood pressure (BP) monitoring is essential with the aim to keep <180 systolic <110 diastolic. In the event of a shortage of nursing staff due to posting for non-neurological COVID-19 patients, continuous BP monitoring may be relied upon with less frequent (than recommended) manual BP testing for the first 24 h. Monitoring for complications and management of complications remains unchanged from the previous guidelines. Risk of antiplatelets, low molecular weight heparin (LMWH) within the first 24 h after treatment with IV alteplase is uncertain and should be avoided unless there are other concomitant conditions for which such treatment will provide a substantial benefit or withholding such treatment will result in a substantial risk.

Recommendations:

- Intravenous thrombolysis should be considered for all eligible patients presenting within the defined time window.

- Standard inclusion and exclusion criteria should apply as per standard guidelines.
- The decision to treat a patient should take into account the seriousness of COVID-19 disease and prognosis.
- In COVID-19 suspected or positive patients, it may be prudent to estimate any specific contraindications especially related to any coagulopathy that merits a contraindication for use.
- Systems should be organized so as not to delay the treatment as the benefit is time-dependent.
- Test reports of SARS-CoV-2 patients suspected for COVID-19 should be made available on a high priority to confirm the final status.

ENDOVASCULAR STROKE TREATMENT

Endovascular stroke treatment (EVT) with either mechanical thrombectomy or thromboaspiration, is a standard of care for ischemic stroke patients due to large vessel occlusion (LVO) subject to the availability of expertise in the hospital. The standard recommendations for managing stroke due to LVO's as per the AHA, ISA, and National Stroke guidelines need to be followed.^[10-13,24,27] All patients should be preferably screened for COVID-19 status before taking up for mechanical thrombectomy (MT) in acute ischemic stroke. The patient must be explained about the procedure and consented. The COVID-19 status should not affect our decision to treat eligible patients with acute ischemic stroke and LVO with EVT.^[27] All standard indications remain in the management of ischemic stroke patients irrespective of the COVID-19 status. Issues of anesthesia and intubation may arise in acutely sick patients with COVID-19 and *all possible healthcare safety measures be applied as per standard guidelines for the management of patients.*^[22,23]

All the stroke team members should be well aware of the safety measures and follow strict protocols. It is advisable to predesignate an angiosuite if feasible in the designated area for such patients during this pandemic and get the angiosuite fumigated after each procedure. The angiosuite must have the do's and don'ts well outlined in this scenario. Only the minimum necessary staff need to be available in the angiosuite to reduce the use of PPE and also to reduce the risk of healthcare workers getting exposed.

COVID-19 non-suspect or negative patient

Standard stroke guidelines should be followed for eligibility, consent, and treatment in a hospital.

COVID-19 Suspect/Positive patient

If the facility for EVT is available at the designated hospital, then all the maximum safety measures need to be followed as per strict protocol with full PPE. In extremely sick patients during respiratory distress, the decision to perform EVT should be individualized. Since intubation and suctioning are aerosol-generating procedures, it is better to consider prophylactic intubation before shifting to angiosuite in

patients with high National Institute of Health Stroke Scale (NIHSS), drowsiness, and vertebrobasilar strokes by following strict guidelines.^[22,23] This will reduce the risk, as emergency intubation in angiosuite is associated with higher risk. After the procedure, the extubation is also better done in the COVID designated ICU. Extubation should be done only after confirming a lesser likelihood of reintubation.

Recommendations:

- EVT should be provided to all eligible patients in centers with the available facility.
- EVT decision for seriously-ill COVID-19 positive or strongly suspected patients could be individualized.
- It may be prudent to designate an angiosuite for this purpose during this pandemic for the suspected or positive patients at designated centers.
- Strict measures for preventing exposure to healthcare providers should be adhered to.
- Standard procedures for sanitization of the angiosuite should be followed after every procedure when treating a COVID-19 suspect or positive patient.
- Test reports of SARS-CoV-2 in suspected COVID-19 patients should be made available on a high priority to confirm the final status.

STROKE UNIT/INPATIENT CARE DURING COVID-19 PANDEMIC

The standard components of stroke unit (SU) care including nursing care bundle (fever swallow and blood sugar [FeSS] protocol), control of BP, blood sugar, prevention and treatment of medical complications, positioning and bedsores prevention, and deep vein thrombosis (DVT) prophylaxis, should be provided to all acute stroke patients wherever availability of resources permit.^[10-13,24,28] The patient should be monitored for any neurological worsening and complications, especially patients with intracerebral hemorrhage and large area of the infarction. Swallow assessment should be carried out in conscious and non-intubated patients to prevent aspiration. However, the care may be modified given the current pandemic and limited nursing staff and among patients being cared in the COVID-19 designated area. Interdepartmental teleconsultation should be used to minimize exposure and reduce the need for PPE's. Appropriate secondary prevention should be started.

SU/Inpatient care in confirmed COVID-19 patient

Confirmed COVID-19 patient with stroke has to be managed in the designated COVID-19 hospital as per guidelines.^[14,15] Standard principles of post-stroke care will apply as discussed above. SARS-CoV-2 specifically binds to ACE (angiotensin converting enzyme) 2 receptors. Although concern was raised in the use of ACE inhibitors or angiotensin II receptor blockers (ARBs), it is not recommended to stop using ACE inhibitors or ARBs as antihypertensive drugs.^[29,30] Other drugs that can be considered are calcium channel blockers, diuretics, and other classes of antihypertensive drugs.

SU/Inpatient care in Suspected COVID-19 patient

The COVID-19 suspected patients will be monitored in the designated COVID-19 isolation areas only till reports of the testing are available. Standard stroke unit care is advised and should be consulted with the neurology/stroke specialists if feasible.

Recommendation:

1. All non-suspect patients should be managed in the designated stroke unit/inpatient unit.
2. Suspected COVID-19 patients should be managed in the designated care facilities only till reports of testing are available.
3. Reports of patients for COVID-19 test status should be made available on high priority.
3. COVID-19 positive patients should be managed in the designated care facilities only.
4. Stroke unit care may be suboptimal during this pandemic. However important components like BP monitoring, sugar monitoring, fever, swallowing, DVT prophylaxis, and bedside care should be provided.
5. The COVID-19 designated areas may not have trained stroke personnel. It may be prudent to educate them regarding stroke care using a telemedicine facility. It may be preferred to have a stroke pathway document available in such areas to help healthcare providers follow the same.

MANAGING SURGICAL COMPLICATIONS

Patients with stroke require surgical interventions not infrequently. Usual scenarios include a patient with intracerebral hemorrhage with or without intraventricular hemorrhage (IVH) and/or hydrocephalus, a cerebellar hemorrhage, malignant middle cerebral artery (MCA) infarction, or posterior fossa infarction with edema or a post thrombolytic bleeding. In the usual scenario, it would be a easy decision to operate. When dealing with a situation of COVID-19 positivity or high-risk situation where results are yet not available, the system has to be geared up to manage such emergencies. The systems of care will also need reorganization. In a recent paper from Italy, the authors describe their experience of the reorganization of the neurosurgical facility, during the massive outbreak in Lombardy, northern Italy.^[31] They had to work on a common platform, prioritize the patients and developed a hub and spoke model to handle the situations in designated facilities with a screening of each patient for active COVID-19 disease.

COVID-19 suspect and positive stroke patients requiring emergent neurosurgical intervention will be managed at the COVID-19 designated facility and all appropriate methods as per guidelines should be in place for minimizing exposure and ensuring adequate safety to the healthcare system and the patient as discussed above in previous sections already. Designated operation theatres (OT's) should be considered by the local health systems wherever feasible and possible. Standard procedures for sanitization should be followed after

every procedure. Reports of such patients for COVID-19 test status should be made available on high priority.

Recommendations:

- Screening of patients should be done to rule out active COVID-19 disease before any procedure.
- Patients requiring urgent neurosurgical interventions should be provided a standard of care.
- For COVID-19 suspected patients, testing for SARS-CoV-2 should be done promptly with rapid results to guide the team if not delaying the procedure.
- All standard PPE measures to reduce exposure to the healthcare personnel and the system are mandatory.
- For COVID-19 suspected and positive patients, neurosurgery facilities should be provided in designated places as per guidelines and outlined safety norms.
- Separate OT for COVID-19 suspect and positive patients and sanitization after every procedure is suggested. Negative pressure operating rooms and/or anterooms when available are recommended.
- Surgeons and personnel not needed for intubation should remain outside the operating room until anesthesia induction and intubation are completed as per guidelines for patients with or suspected of having COVID-19 infection.
- All OT personnel should take care of proper donning and doffing of PPE.

REHABILITATION:

Stroke rehabilitation services during the pandemic are likely to be suboptimal. We can provide very limited guidance to stroke teams at this time and systems will need reorganization to support rehabilitation services. Routinely, a physiotherapist occupational therapist, speech therapist, language therapist, and clinical psychologist all have specific roles to play in post-stroke rehabilitation. However, during the pandemic, these services cannot be provided optimally and need to be specific and prioritized based on the immediate needs of the patient, to minimize staff exposure and limit the use of PPE's. Both the COVID-19 suspect and the positive patient shall be managed in the designated inpatient area only. Since, carrying out of rehabilitation activities in hospital wards, and in services in general, require close contact with the patient, or with the production of aerosols and secretions, this can only be continued in compliance with the needs of the patients and the protection of the health of all staff. Appropriate precautions in handling these patients are strictly recommended. Tele-rehabilitation facility if available should be utilized maximally during these times.

Recommendations:

- All COVID-19 nonsuspect or negative patients are treated in the designated stroke/inpatient units.
- Rehabilitation services should be reorganized to tailor the needs of the patient and that is most necessary.

- Training to the caregivers is essential if they are allowed in the designated areas.
- For COVID-19 positive and suspected patients being managed in the designated facility, the nurse could be trained through tele rehab regarding position, passive movement, and even mobilizing and swallowing tests for the dysphagia evaluation, where needed.
- All appropriate measures should be taken to provide safety to the healthcare worker and minimize exposure to a COVID-19 positive patient and till results of the COVID-19 suspected patients are available.

SECONDARY PREVENTION AND FOLLOW-UP ADVICE.

COVID-19 positive and suspect patients (till results available for COVID testing), may have an issue with detailed etiological evaluation as they require isolation and cannot be shifted for investigations (including vascular imaging, echocardiography, and Holter). Where necessary the decision to perform a test should be individualized.

It may be prudent to perform vascular imaging during baseline evaluation in the emergency itself. If the echocardiography is available as a point of care device in the COVID-19 designated areas for monitoring, it could be used to garner information on the cardiac status and if possible, a carotid doppler could also be performed using the same machine. Risk factors, routine blood investigations, ECG, and the pattern of ischemia on imaging, may help in discerning the stroke mechanism. Patients should be started on aspirin, statin, and other specific medications as per risk factors and possible etiology. Anticoagulation should be only started if there is a cardioembolic source and after considering any exclusions among the patients. Compliance should be encouraged and the patient should have adequate medications at home. The patient should be discharged as soon as stable and in a COVID-19 patient as per the guidelines and stability, with optimum advice. Follow-up visits could be carried out using the telemedicine facilities wherever feasible during the current pandemic.

Recommendations:

- Evaluation with all investigations may not be possible during this period.
- Try to establish stroke etiology wherever possible.
- Appropriate secondary prevention should be provided using available information on the history of risk factors, the pattern on imaging and laboratory data as echocardiography and Holter monitoring may not be available in routine.
- Follow-up advises for compliance should be made.
- Telemedicine consultation should be provided for a follow-up period during the pandemic.

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Conflicts of interest

There are no conflicts of interest.

Disclaimer

- The members of the expert group outline the needs and challenges that may exist in managing patients with acute stroke during this pandemic.
- This is a document to help centers to organize stroke care during this pandemic considering problems that are foreseen.
- It is extremely important in each healthcare setting that a discussion takes place between teams managing strokes, COVID-19, emergency services, collaborative departments, and hospital administration to optimize management and reorganize their stroke services to minimize exposure without compromising timely acute stroke care.
- The safety of healthcare workers should be adhered to in COVID-19 suspect and positive patients.
- This is not intended as an evidence-based guideline in the management of stroke in general for which existing management guidelines for stroke will apply to all patients.
- The standard guidelines for managing COVID-19 suspects or patients should be followed as laid down by the Ministry of Health and Family Welfare (MoHFW), Government of India and as updated from time to time.
- Any change in the existing guidelines/advisories by MoHFW, Govt of India should be periodically checked.
- Resource limitation during the current pandemic may not allow for absolute optimized management, but important steps in the stroke care pathway should be followed.

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